

What is claimed is:

1. An optical head having:

a bobbin formed with a center hole and

a first optical lens mounted on said bobbin via

5 a thermal expansion adjustment member formed with an opening,

said first optical lens having a substrate formed by an optical material different from said bobbin in coefficient of thermal expansion,

10 said substrate having:

a convex part functioning as a convex lens and

a flat part positioned around said convex part,

said flat part is fixed to said thermal expansion adjustment member so that said convex part fits
15 in said opening, and

said first optical lens is placed so that a center axis of said convex part or an extension thereof passes through the center hole of said bobbin.

2. An optical head as set forth in claim 1,

20 wherein

the coefficient of thermal expansion of said thermal expansion adjustment member is a value between the coefficient of thermal expansion of said bobbin and the coefficient of thermal expansion of said first
25 optical lens.

3. An optical head as set forth in claim 1,
wherein said thermal expansion adjustment member is fixed
to said bobbin.

4. An optical head as set forth in claim 1,
5 wherein said thermal expansion adjustment member is fixed
to said bobbin via a spacer.

5. An optical head as set forth in claim 1,
wherein a second optical lens is arranged at the center
hole of said bobbin.

10 6. An optical head as set forth in claim 1,
wherein

said thermal expansion adjustment member is an
optical material having a constant or substantially
constant thickness and is formed by the same material as
15 the optical material of said first optical lens and

the height of said convex part from the surface
of said flat part is lower than the thickness of said
thermal expansion adjustment member.

7. An optical head as set forth in claim 1,
20 wherein:

the center axis of said convex part coincides
or substantially coincides with the center axis of the
center hole of said bobbin;

a groove is formed around said convex part;
25 a coil is wound around an outer circumference

of said bobbin;

the material of said bobbin is plastic; and
the material of said first optical lens is
glass.

5 8. An optical head having:

a bobbin formed with a center hole and
an optical lens mounted on said bobbin via a
thermal expansion adjustment member,

10 said optical lens having a substrate formed by
an optical material different from said bobbin in
coefficient of thermal expansion,

 said substrate having:

a convex part functioning as a convex lens;

a flat part positioned around said convex part;

15 and

an outer circumference part positioned around
said flat part, wherein

a thickness of said outer circumference part is
greater than that of said convex part;

20 said outer circumference part is fixed to said
thermal expansion adjustment member; and

 said optical lens is placed so that a center
axis of said convex part or an extension thereof passes
through the center hole of said bobbin.

25 9. An optical head as set forth in claim 8,

wherein a coefficient of thermal expansion of said thermal expansion adjustment member is a value between the coefficient of thermal expansion of said bobbin and the coefficient of thermal expansion of said optical lens.

10. An optical head as set forth in claim 8, wherein said thermal expansion adjustment member is fixed to said bobbin.

11. An optical head as set forth in claim 8, wherein said thermal expansion adjustment member is an optical material having a constant or substantially constant thickness and is formed by the same material as the optical material of said optical lens.

12. An optical head as set forth in claim 8, wherein said thermal expansion adjustment member is formed with an opening and said optical lens is placed so that said convex part protrudes to said opening.

13. An optical head as set forth in claim 8, wherein a mask layer is formed on a surface of said outer circumference part and said mask layer of said outer circumference part is fixed to said thermal expansion adjustment member.

14. An optical head as set forth in claim 8,

wherein

the center axis of said convex part coincides
or substantially coincides with the center axis of the
center hole of said bobbin;

5 a groove is formed around said convex part;
a coil is wound around an outer circumference
of said bobbin;

the material of said bobbin is plastic; and
the material of said optical lens is glass.

10 15. An optical head having:

a bobbin formed with a center hole and
an optical lens,

said optical lens having a substrate formed by
an optical material different from said bobbin in
15 coefficient of thermal expansion,

said substrate having:

a convex part functioning as a convex lens;

a flat part positioned around said convex part;

and

20 an outer circumference part positioned around
said flat part, wherein

a thickness of said outer circumference part is
greater than that of said convex part;

said outer circumference part is fixed to said
25 bobbin; and

said optical lens is placed so that a center axis of said convex part or an extension thereof passes through the center hole of said bobbin.

16. An optical head as set forth in claim 15,
5 wherein a mask layer is formed on a surface of said outer circumference part and said mask layer of said outer circumference part is fixed to said bobbin.

17. An optical head as set forth in claim 15,
wherein

10 the center axis of said convex part coincides or substantially coincides with the center axis of the center hole of said bobbin;

a groove is formed around said convex part;
a coil is wound around an outer circumference
15 of said bobbin;

the material of said bobbin is plastic; and
the material of said optical lens is glass.

18. An optical pickup having:
an optical head functioning as an object lens
20 part when mounted in a recording and/or reproducing apparatus of an optical storage medium and

a photodetector for receiving a reflected light beam for use in recording and/or reproduction to and from the optical storage medium,

25 said optical head having

a bobbin formed with a center hole and
a first optical lens mounted on said bobbin via
a thermal expansion adjustment member formed with an
opening,

5 said first optical lens having a substrate
formed by an optical material different from said bobbin
in coefficient of thermal expansion,

10 said substrate having
a convex part functioning as a convex lens and
a flat part positioned around said convex part,
said flat part is fixed to said thermal
expansion adjustment member so that said convex part fits
in said opening, and

15 said first optical lens is placed so that a
center axis of said convex part or an extension thereof
passes through the center hole of said bobbin.

19. An optical pickup as set forth in claim 18,
wherein

20 the coefficient of thermal expansion of said
thermal expansion adjustment member is a value between
the coefficient of thermal expansion of said bobbin and
the coefficient of thermal expansion of said first
optical lens.

25 20. An optical pickup as set forth in claim 18,
wherein said thermal expansion adjustment member is fixed

to said bobbin.

21. An optical pickup as set forth in claim 18,
wherein said thermal expansion adjustment member is fixed
to said bobbin via a spacer.

5 22. An optical pickup as set forth in claim 18,
wherein

a second optical lens is placed at the center
hole of said bobbin and

10 a light beam is supplied irradiated from a
recording and/or reproducing light beam generating
apparatus and passed through said second optical lens to
said first optical lens.

23. An optical pickup as set forth in claim 18,
wherein

15 said thermal expansion adjustment member is an
optical material having a constant or substantially
constant thickness and is formed by the same material as
said first optical lens and

20 the height of said convex part from the surface
of said flat part is lower than the thickness of said
thermal expansion adjustment member.

24. An optical pickup as set forth in claim 18,
further having a magnet,

25 the center axis of said convex part coincides
or substantially coincides with the center axis of the

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a groove is formed around said convex part,
a coil is wound around an outer circumference
of said bobbin,

5 the material of said bobbin is plastic,
 the material of said first optical lens is
 glass, and

said magnet and said coil configure an actuator
for moving said bobbin.

10 25. An optical pickup having:

 an optical head functioning as an object lens

part when mounted in a recording and/or reproducing

apparatus of an optical storage medium and

 a photodetector for receiving a reflected light

15 beam for use in recording and/or reproduction to and from

the optical storage medium,

said optical head having
a bobbin formed with a center hole and
an optical lens mounted on said bobbin via a
20 thermal expansion adjustment member,
said optical lens having a substrate formed by
an optical material different from said bobbin in
coefficient of thermal expansion,

said substrate having:

25 a convex part functioning as a convex lens;

a flat part positioned around said convex part;
and

an outer circumference part positioned around
said flat part,

5 a thickness of said outer circumference part is
greater than that of said convex part,

said outer circumference part is fixed to said
thermal expansion adjustment member, and

10 said optical lens is placed so that a center
axis of said convex part or an extension thereof passes
through the center hole of said bobbin.

26. An optical pickup as set forth in claim 25,
wherein a coefficient of thermal expansion of said
thermal expansion adjustment member is a value between
15 the coefficient of thermal expansion of said bobbin and
the coefficient of thermal expansion of said optical
lens.

27. An optical head as set forth in claim 25,
wherein said thermal expansion adjustment member is fixed
20 to said bobbin.

28. An optical pickup as set forth in claim 25,
wherein

said thermal expansion adjustment member is an
optical material having a constant or substantially
25 constant thickness and is formed by the same material as

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said optical lens and

a light beam is supplied irradiated from a recording and/or reproducing light beam generating apparatus and passed through said thermal expansion adjustment member.

29. An optical pickup as set forth in claim 25, wherein

said thermal expansion adjustment member is formed with an opening and

said optical lens is placed so that said convex part protrudes to said opening.

30. An optical pickup as set forth in claim 25, wherein a mask layer is formed on a surface of said outer circumference part and said mask layer of said outer circumference part is fixed to said thermal expansion adjustment member.

31. An optical pickup as set forth in claim 25, further having a magnet,

the center axis of said convex part coincides or substantially coincides with the center axis of the center hole of said bobbin,

a groove is formed around said convex part,

the material of said bobbin is plastic,

the material of said optical lens is glass, and

said magnet and said coil configure an actuator

for moving said bobbin.

32. An optical pickup having:

an optical head functioning as an object lens
part when mounted in a recording and/or reproducing

5 apparatus of an optical storage medium and

a photodetector for receiving a reflected light
beam for use in recording and/or reproduction to and from
the optical storage medium,

said optical head having

10

a bobbin formed with a center hole and

an optical lens,

said optical lens having a substrate formed by
an optical material different from said bobbin in
coefficient of thermal expansion,

15

said substrate having:

a convex part functioning as a convex lens;

a flat part positioned around said convex part;

and

an outer circumference part positioned around

20

said flat part,

said outer circumference part is fixed to said
bobbin, and

said optical lens is placed so that a center
axis of said convex part or an extension thereof passes
25 through the center hole of said bobbin.

33. An optical pickup as set forth in claim 32, wherein a mask layer is formed on a surface of said outer circumference part and said mask layer of said outer circumference part is fixed to said bobbin.

5 34. An optical pickup as set forth in claim 32, further having a magnet,

the center axis of said convex part coincides or substantially coincides with the center axis of the center hole of said bobbin,

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a groove is formed around said convex part, the material of said bobbin is plastic, the material of said optical lens is glass, and said magnet and said coil configure an actuator for moving said bobbin.

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